**Career Academy Integrated Unit Plan**

**Academy Name: Biomed STEM**  **School: University High School**

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| **Integrated Unit Plan Title**: The Mystery of Isabella Garcia |
| **Courses to integrate:** Geometry, Algebra II, Chemistry, Biomed, Plant Biotech |
| **Grade Level:** 10th |
| **Timeline & Duration:** Weeks 5-9 (4 weeks) in 1st quarter. |
| **Essential Question:** How are Principles of Bio-Med utilized to process and analyze key information within a crime scene. |

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| **Unit Summary:** Using Chemistry, Geometry, and Algebra in order to analyze and solve a forensic mystery within Principles of Bio-Med. |

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| **Overview of Activities/Lessons per Course** | | | | |
| Course | Bio-Med | Algebra | Geometry | Chemistry |
| Activity/Lesson | **Activity 1:**  Introduce The Mystery of Isabella Garcia with crime scene photos | **Activity 1:**  Students will use parallelism and perpendicularity to analyze a crime scene. | **Activity 1:**  Use inductive and deductive reasoning to determine the logical steps when analyzing a crime scene | **Activity 1:**  Students will be introduced to the molecular structure of DNA through power point presentation |
| Activity/Lesson | **Activity 2:** Micropipetting Lesson | **Activity 2:**  Lengthy Relationships Lab: Students will gather data and determine if there is a relationship between foot length, leg length and height. | **Activity 2:**  To gather data to determine if there is a relationship between foot length, leg length and height of a person when analyzing a footprint at a crime scene. | **Activity 2:**  Students will engage in an introductory DNA electrophoresis lab |
| Activity/Lesson | **Activity 3:**  Intro to gel electrophoresis |  |  | **Activity 3:**  Students will test soil for pH level from garden and suspect’s kitchen by engaging in pH lab |
| Activity/Lesson | **Activity 4:**  Making buffer/casting/running gels |  |  |  |
| Activity/Lesson | **Activity 5:**  PCR |  |  |  |
| Activity/Lesson | **Activity 6:**  Interpretation of DNA (comparing plant vs. animal) |  |  |  |
| Activity/Lesson | **Activity 7:**  Conclusion: Have each group perform as an expert witness (either for defense or prosecution) in a Trial & provide a Formal Lab Report as expert witness. |  |  |  |

**Lesson Instructions for Principles of Bio-Med (course):**

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| **Standards (Performance Tasks or Course Frameworks or Sunshine State Standards ):**  BioMed Sciences SSS: 04.02, 04.03, 04.04, 04.05; 09.02; 10.03, 10.04; 15.04, 15.05; 16.01, 16.02, 16.03, 16.04  **Rigor & Relevance (quadrant):**  Quadrant: D - Adaption: Applies to real world predictable situations and according to Bloom’s Taxonomy it is analysis, synthesis, and evaluation. |
| **Instructions to Teacher:**  Introduce The Mystery of Isabella Garcia to students. Instruct students how to perform and analyze DNA tests on onion, skunk, and human blood/DNA by using various lab techniques such as micropipetting, staining, electrophoresis, PCR, and comparing against a normal ladder. (Perform activities 1-7) |
| **Instructions to Students:**  Students will gain a better understanding of lab techniques by micropipetting, staining gels, electrophoresis, and PCR. Students will solve the mystery of Isabella Garcia’s death as a real world applicable problem using forensic techniques.  (Perform Activities 1-7) |
| **Instructions for Student Accommodations:**  Strategic grouping of students, Review PowerPoints when requested, Behavioral Strategies, Classroom placement/arrangement, Extended time for students when needed, organizational strategies, and technology usage. |
| **Assessment for Activity:**  Cumulative assessment to be given in BioMed/ Plant Biotech via creating a lab report and having students perform as forensics experts in the investigation of Isabella Garcia’s death.   * Scientific reporting in the form of a formal lab report, final presentation with PowerPoint, and a court-style debate. Students will report their findings from the entire project, analyzing the situation, findings, and general reporting of the data they collected throughout the unit. * Students will create a conclusion about who committed the crime and support this with their data. * The class will be divided as “defense” and “prosecution” and debate their findings as they are in their final stages of analysis of the data. * They will then write up the final report explaining how they believe Ms. Garcia died and how the data supports the conclusion. |
| **Approximate Length of Time for Activity:**  4-5 weeks |
| **Materials Needed:**  The Mystery of Isabella Garcia Resource Sheet, writing utensil, paper, evidence photos, computers, mass spectrophotometer, electrophoresis kit with power source, micropipets, enzymes, stain, & DNA (bovine, sheep, & onion). |
| **Resources Needed:**  Computers, PowerPoint, Projector, white board, etc. |
| Attachments: |

**Lesson Instructions for Geometry (course) Activity 1:**

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| **Standards (Performance Tasks or Course Frameworks or Sunshine State Standards ):**  MA.912.D.6.3/MA.912.6.4 Determine whether a given short proof is logically valid.  MA.912.G.8.3 Determine if a solution is reasonable based on the given situation  MA.912.G.8.4 Make conjectures and justify and support the conjectures with geometric proofs  MA.912.G.8.2 Use a variety of problem solving strategies to include diagramming, charting, trial and error.  **Rigor & Relevance (quadrant):**  Quadrant B – Students use acquired knowledge to solve problems, design solutions, and complete work. The highest level of application is to apply knowledge to new and unpredictable situations |
| **Instructions to Teacher:**  Teacher will prepare the lesson by following the logical steps in processing a crime scene. |
| **Instructions to Students:**  Students will use trial and error, process of elimination, and logical reasoning to solve a real world problem. |
| **Instructions for Student Accommodations:**  Teacher-led activity, Group Activity, Group Discussion, Extended time for students when needed |
| **Assessment for Activity:**  Cumulative group project will be graded in Biomedical and Plant Biotechnical STEM class |
| **Approximate Length of Time for Activity:**  4 weeks |
| **Materials Needed:**  Pencil, notebook, and don’t forget your BRAIN |
| **Resources Needed:**  The Mystery of Isabella Garcia Resource Sheet. |
| Attachments: |

**Lesson Instructions for Geometry activity 2 (course):**

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| **Standards (Performance Tasks or Course Frameworks or Sunshine State Standards ):**  MA.912.G.8.2 – demonstrate and use a variety of problem solving strategies to include diagramming, charting, equation writing and solving, trial and error  MA.912.G.8.3 – determine if a solution is reasonable based on the given situation  MA.912.G.8.4 – make conjectures and justify and support the conjectures with geometric concepts  MA.912.D.11.5 – use algebra to apply theorems where segments are divided proportionally  MA.912.g.2.4 – do ratio and proportion practice  **Rigor & Relevance (quadrant):**  Quadrant B – Students use acquired knowledge to solve problems, design solutions, and complete work. The highest level of application is to apply knowledge to new and unpredictable situations |
| **Instructions to Teacher:**  Teacher will print up the lab procedures for the students. Teacher will set up a 20 meter section of hallway where the students will collect their data. Get the students working in teams to measure the heights and corresponding foot lengths of each other. |
| **Instructions to Students:**  Gather data. Calculate ratios. Plot data on scatter plots. Describe patterns and examine graphs to determine if there are relationships between the variables. |
| **Instructions for Student Accommodations:**  Teacher-led activity, Group Activity, Group Discussion, Extended time for students when needed. |
| **Assessment for Activity:**  Cumulative group project will be graded in Biomedical and Plant Biotechnical STEM class. |
| **Approximate Length of Time for Activity:**  4 weeks |
| **Materials Needed:**  meter stick, graph paper, notebook, calculator, pencil |
| **Resources Needed:**  Lengthy relationships lab handout, mobiboard, projector, and computer. |
| Attachments: |

**Lesson Instructions for \_\_Algebra II\_\_\_ (course):**

**Lesson Instructions for Algebra - activity 1 :**

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| **Standards (Performance Tasks or Course Frameworks or Sunshine State Standards ):**  MA.912.A.3.11 – determine the slope of a line in terms of the data  MA.912.G.1.4 – use coordinate geometry to find slopes, parallel lines, perpendicular lines and equations of lines  MA.912.A.3.10 – find the equation of a line parallel or perpendicular to a given line through a given point on the new line  **Rigor & Relevance:** Quadrant B: Application – Students use acquired knowledge to solve problems, design solutions, and complete work. The highest level of application is to apply knowledge to new and unpredictable situations |
| **Instructions to Teacher:**  Teacher will prepare PowerPoint slides for handout, review finding slope(algebraically and geometrically), present the PowerPoint presentation, facilitate discussion and analysis of Ms. Garcia’s door. Send report of results to teammates. |
| **Instructions to Students:**  Students will calculate slopes (algebraically and geometrically) to confirm the relationship between opposite and consecutive sides of doors. Students will use this relationship to determine if Ms. Garcia’s door was tampered with. |
| **Instructions for Student Accommodations:**  Strategic grouping of students; Review PowerPoint when requested; Behavioral Strategies; Classroom placement/arrangement; Extended time for students when needed; organizational strategies; and technology usage. |
| **Assessment for Activity:**  Cumulative group project will be graded in Biomedical STEM class. |
| **Approximate Length of Time for Activity:**  One 50 minute class period |
| **Materials Needed:**  Pencil, calculator, PowerPoint presentation slides, writing equations worksheet |
| **Resources Needed:**  Computer, projector, and PowerPoint presentation |
| Attachments: PowerPoint Presentation; writing equations handout |

**Lesson Instructions for Algebra - activity 2 :**

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| **Standards (Performance Tasks or Course Frameworks or Sunshine State Standards ):**  MA.912.A.3.8 - graph scatter plots and determine correlations  MA.912.g.2.4 – do ratio and proportion practice  MA.912.A.3.11 – use lines of best fit (trend lines) to make predictions  MA.6.A.2.2 - compare ratios using proportions  **Rigor & Relevance:** Quadrant B: Application – Students use acquired knowledge to solve problems, design solutions, and complete work. The highest level of application is to apply knowledge to new and unpredictable situations |
| **Instructions to Teacher:**  Teacher will print up the lab procedures for the students, review key concepts of ratios and proportions, arrange students into lab groups and facilitate the student guided lab. Send report of results to teammates. |
| **Instructions to Students:**  Students will gather data, calculate ratios, plot data on scatter plots, describe patterns and examine graphs to determine if there are relationships between the variables.  Students will use said relationship to analyze the foot prints found in Ms. Garcia’s garden. |
| **Instructions for Student Accommodations:**  Strategic grouping of students; Review PowerPoint when requested; Behavioral Strategies; Classroom placement/arrangement; Extended time for students when needed; organizational strategies; and technology usage. |
| **Assessment for Activity:**  Informal assessment throughout lab; lab conclusion write-up; cumulative group project will be graded in Biomedical STEM class. |
| **Approximate Length of Time for Activity:**  Two 50 minute class periods |
| **Materials Needed:**  meter stick, graph paper, notebook, calculator, pencil |
| **Resources Needed:**  Lab handout |
| Attachments: Lengthy Relationships Lab |

**Lesson Instructions for Chemistry:**

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| **Standards (Performance Tasks or Course Frameworks or Sunshine State Standards ):**  SC.912.N.1.2-7; SC.912.N.2.2; SC.912.N.3.1;SC.912.N.3.5;SC.912.N.4.2;LA.910.2.2.3;SC.912.P.8.2;SC.912.P.8.7  **Rigor & Relevance (quadrant):** A, C |
| **Instructions to Teacher:**  Activity1: Teacher will begin DNA lesson with CSI/forensic video to introduce how DNA is used in a forensic investigation. Teacher will then provide power point to deliver necessary introductory information for DNA. Practice worksheets will reinforce this information.  Activity 2: Electrophoresis introductory lab.  Activity 3: Along with preliminary pH information, teacher will set up pH probes, onions with necessary soil attached, and indicators. Teacher will provide laboratory protocol. Rubric will be used for laboratory write up. |
| **Instructions to Students:**   * Students will take notes on DNA * Students will participate in both activities in group settings. They will be responsible for reading, interpreting, setting up, and implementing lab. Detailed observations must be recorded during labs, and then used for final lab write up which will include a conclusion. Rubric will detail necessary components to include. |
| **Instructions for Student Accommodations:**  Strategic grouping of students, Review PowerPoints when requested, Behavioral Strategies, Classroom placement/arrangement, Extended time for students when needed, organizational strategies, and technology usage. |
| **Assessment for Activity:**  Activity 1: worksheets, and summative test  Activity 2: detailed lab write up assessed with rubric  Activity 3: detailed lab write up assessed with rubric |
| **Approximate Length of Time for Activity:**  Total time for all three activities will encompass 4 weeks time |
| **Materials Needed:**  Materials include power point notes, worksheets, lab protocols, and rubrics. See attachments |
| **Resources Needed:**  Power point presentation, computer, projector. See attachment for necessary lab materials |
| **Attachments:** worksheets, lab protocols, rubrics |